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March 8, 2010

Ms. Dana Dean, Associate Director - Mining
Division of Oil, Gas & Mining
Utah Department of Natural Resources
P.O. Box 145801
Salt Lake City, Utah 84114 - 5801

Attn: Paul Baker, Minerals Regulatory Program

Re: M/035/009
Kennecott Barneys Canyon Mine Final Heap Leach Closure Plan
Submittal of Two (2) Clean Copies & Revised Table of Contents

Pursuant to your letter dated February 23, 2010, please find attached two (2) clean copies of the final Barneys Canyon Heap Leach Closure Plan and two (2) sets of revised Barneys Canyon Mining & Reclamation Plan Title Page and Table of Contents reflecting the final Barneys Canyon Heap Leach Closure Plan as Appendix M.

Please contact me if you have any questions or would like to arrange a meeting to discuss this plan.

Sincerely,

Philip I Ar[illegible] for

Ray Gottling
Manager

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# MINING AND RECLAMATION PLAN

# KENNECOTT CORPORATION

# BARNEYS CANYON MINE

## East Barneys Canyon Project

## SUBMITTED TO UTAH DIVISION OF OIL, GAS AND MINING

**June 7, 2000**
**Revised February 2010**

**KENNECOTT BARNEYS CANYON MINING COMPANY**
**P. O. BOX 311**
**Bingham Canyon, Utah 84006-0311**

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# LIST OF APPENDIX

# KENNECOTT BARNEYS CANYON MINE HEAP LEACH PAD CLOSURE PLAN

Submitted to:

Utah Division of Water Quality (Permit Number UGW350001)

Utah Division of Oil, Gas and Mining (Permit Number M/035/009)

July 15, 2009
Revised
January 28, 2010

Kennecott Barneys Canyon Mining Company

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# KENNECOTT BARNEYS CANYON MINE SUPPLIMENTAL HEAP LEACH PAD CLOSURE PLAN

## INTRODUCTION

Closure activities at the Barneys Canyon Mine have been completed in accordance with the 2000 Waste Rock Management Plan and the 2000 Barneys Canyon Mine Mining and Reclamation Plan. However, a supplemental closure plan that is specific to the heap leach pads is required by the Division of Water Quality (DWQ). Groundwater Discharge Permit Number UGW350001 for the Barneys Canyon Mine (2008) requires that:

"A closure document shall be submitted for review and approval twelve months prior to the end of the operational term of any heap leach pads in the project."

This document is intended to fulfill the requirements listed for the heap leach closure plan with particular emphasis on water management and water quality protection.

Mining at the Barneys Canyon Gold Mine ended in 2001 and only the cyanide heap leach operations are currently active. The leaching and gold recovery operations will likely end in 2010, 2011, 2012 or 2013. However, the actual date when active leaching will end is not certain because it is based on gold price and the rate at which gold concentrations in the pregnant leach solution decline. This plan may be submitted more than 12 months before heap leach closure because of these uncertainties.

### Completed Reclamation Activities

The oxide waste rock dumps and sulfide waste rock repositories have all been closed in accordance with the 2000 Waste Rock Management Plan (Groundwater Discharge Permit number UGW350001) and the 2000 Barneys Canyon Mine Mining and Reclamation Plan (revised plan submitted to DOGM on June 7, 2000). The oxide waste rock dumps were recontoured and capped with six inches of soil before being seeded. The sulfide repositories were capped with 10 feet of oxide waste rock and three feet of fine-grained topsoil before being both seeded and planted with a mixture of deep-rooting native grass, forb, tree and shrub species.

Small pit lakes have formed in the bottom of both the Barneys and East Barneys open pits. These lakes both have a neutral to slightly alkaline pH and relatively low total dissolved solids concentrations (<700 mg/L). Demolition of the truck shop, mill, conveyors and other mining-related infrastructure was also completed in 2006 and 2007.

## HEAP LEACH PAD CLOSURE REQUIREMENTS

The Barneys Canyon mine heap leach operations are governed by Utah Groundwater Discharge Permit Number UGW350001. The 2008 permit specifies operating and monitoring requirements for the active heap leach pads. The following closure requirements are also detailed in the permit:

- "The heap leach pads must be reclaimed in such a way that groundwater pollution is prevented. Any heap leach closure scenario that envisions the release of contact water to the environment will require that approved water quality criteria be met for three consecutive monthly samples before contact water release can occur. The sampling procedure must be submitted in the closure plan for review and approval. In no case shall the closure criteria for this heap leach project result in degradation of the surface or groundwater quality including beneficial uses thereof in the vicinity."

- "A closure document shall be submitted to both the Division of Water Quality and the Division of Oil, Gas and Mining for review and approval twelve months prior to the end of the operation of the heap leach pads and will include the following. a) An estimation of the potential for post-closure leaching of contaminants from the leach pads and justification for the type of cover or cap placed over them to prevent groundwater pollution; b) Plans and procedures for pipeline removal and heap leach closure; c) Plans for post-closure ground water monitoring; and d) Copies of any other reclamation or closure plans filed with other agencies."

The Barneys Canyon Mine Mining and Reclamation Plan submitted to the Utah Division of Oil, Gas and Mining under permit number M/035/009 in 2000 also lists the following requirements for closure of the heap leach pads:

- "The leach pads will either be rinsed or will be designed to allow for long-term water collection and treatment. The management criteria will ensure that no degradation of the surface or groundwater quality or beneficial use thereof takes place following regrading and revegetation of the heaps".

- The leach pads "will be re-contoured to gradually rounded slopes of 2.5h:1v or less. The recontouring process will include pushing heap material over the pad marginal dikes to cover the exposed liner. Before placing the material outside the liner, it will be tested to insure it poses no threat to surface or groundwater quality" (Note this is no longer the plan, instead all heap leach material will be kept on the liner during recontouring and clean fill will be used to cover the exposed liner berm).

- "The rinsed leach solution pipelines will be taken up and removed from the site. The liners in the pipeline trenches outside the leach pads will be removed from the trenches, rolled up, and disposed in the solution pond excavations prior to their being backfilled. The trenches will then be regraded, topsoiled and revegetated" (Note that much of the pipe may be removed and buried within the heap leach pads without rinsing).

- "All disturbed areas with the exception of the open pits, clay borrow areas and the Melco South dump out slopes will be covered with topsoil. All sites will be covered to a nominal thickness of six inches."

In addition Utah Rule R647-4 for Large Mining Operations states that:

- "Revegetation shall be considered accomplished when the revegetation has achieved 70 percent of the premining vegetative ground cover. If the premining vegetative ground cover is unknown, the ground cover of an adjacent undisturbed area that is representative of the premining ground cover will be used as a standard. Also, the vegetation has survived three growing seasons following the last seedling, fertilization or irrigation, unless such practices are to continue as part of the postmining land use."

- "The species seeded shall include adaptable perennial species that will grow on the site, provide basic soil and watershed protection, and support the postmining land use."

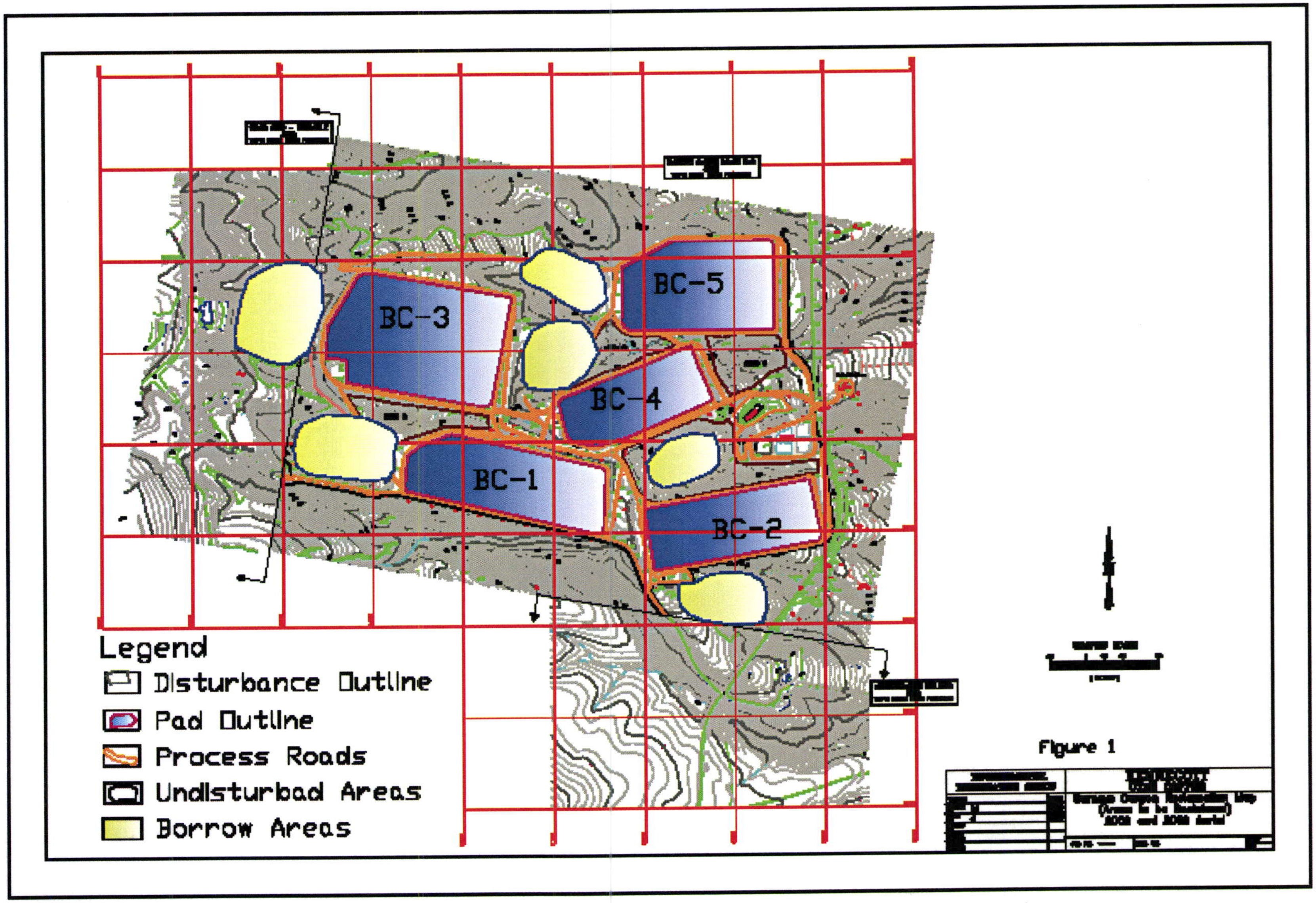
## HEAP LEACH PAD DESCRIPTION

### Existing Facilities

There are five heap leach pads at Barneys Canyon covering 160 acres and holding 30 million tons of spent heap leach material (Figure 1). The heaps were constructed with up to nine lifts and vary from 80 to 180 feet high with an average height of 130 feet. A step back was constructed for each lift so that the overall external slopes are maintained at 2.5 horizontal to 1 vertical (22 degrees). The characteristics of the individual heap leach pads are summarized in Table 1.

Table 1 – Heap Leach Pad Characteristics

| Pad | Ore (million tons) | Surface Area (acres) | Ore Stacking Dates |
|---|---|---|---|
| BC-1 | 5.7 | 33 | 1989 – 2000 |
| BC-2 | 4.5 | 27 | 1990 – 1996 |
| BC-3 | 10.6 | 48 | 1992 – 2002 |
| BC-4 | 3.0 | 20 | 1995 – 2000 |
| BC-5 | 5.8 | 31 | 1997 – 2001 |


BC-3
BC-5
BC-4
BC-1
BC-2
Legend
Disturbance Outline
Pad Outline
Process Roads
Undisturbed Areas
Borrow Areas
Figure 1

The base of each pad is graded so that the leach solution reports to one corner of the pad. The pads are underlain by a composite liner with a leak detection system. From top to bottom the components of the liner are:

- Four feet of crushed ore and perforated pipe underdrain layer,
- 60 mil HDPE liner,
- One foot compacted clay liner with a hydraulic conductivity of $10^{-7}$ cm/sec,
- Six inches of high permeability underdrain layer (leak detection layer),
- Compacted sub-base with a hydraulic conductivity of $10^{-6}$ cm/sec.

Lined drainage channels and berms are maintained on the outer edge of each leach pad to prevent the loss of leach solutions or ore.

## Spent Ore and Contact Water Chemistry

Approximately 28 million tons of oxide ore and two million tons of sulfide ore tailings were placed on the heap leach pads. The ARD risk posed by these materials is low. The oxide ore by definition contains few if any intact sulfide minerals. Flotation of the pyrite from the sulfide ore resulted in recovery of more than 90% of the sulfides, so the tailings were generally depleted in sulfide-sulfur. The rock types that were placed on the heap leach pads included dolomite, calcareous sandstone and quartzite that had variable but typically significant neutralization potentials. In order to agglomerate fine material in the heaps, cement was also added at a nominal rate of about 7.6 pounds per ton of ore. This cement addition also contributes to the neutralization potential. Two samples collected from leach pads BC-2 and BC-4 in 2004 only contained 0.13% sulfide sulfur on average and a had mean net neutralization potential of 490 tons $CaCO_3$/1000 tons. The low acidification risk is also supported by the paste pH observed in 38 composite samples collected from 14 well distributed geoprobe holes in October 2005, which varied between 5.6 and 9.7 with a mean value of 8.5.

The paste conductivity of the heap leach ore, a measure of soil salinity, is elevated (mean equals 3300 μS/cm) and could inhibit the growth of some very salt sensitive plant species. Salts have been leached from the ore and imported with makeup water into the leach circuit. Evapo-concentration processes over the past 15 years have likely concentrated salts in the leach solutions and in the soil pore water of the leached ore.

The spent heap leach ore also contains mean concentrations of arsenic (1300 mg/kg), mercury (1 mg/kg), selenium (3 mg/kg), silver (2 mg/kg) and thallium (69 mg/kg) that are significantly elevated above average crustal abundance. Concentrations of these elements are naturally elevated in many gold deposits. Fortunately Synthetic Precipitation Leaching Procedure (SPLP) tests and plant tissue analysis indicate that the arsenic and other metals within the ore are not highly soluble or bioavailable. All 21 SPLP results for the ore were below the toxicity characteristic level for classification as a hazardous waste for all analytes. The maximum arsenic concentration in the leachate samples was 2.2 mg/L versus the toxicity characteristic concentration of 5 mg/L.

Although the SPLP test procedure is not used for formal waste classification, the low metals concentrations in the SPLP leachate indicate that leaching risks from the ore are low. Similarly, mean vegetation tissue metals concentrations from eight volunteer plants growing in the ore were all below NRC (2005) guidelines for animal feed. Mean arsenic concentrations in the plant tissue were 8 mg/kg versus NRC guidelines for livestock of 30 mg/kg.

Several trace elements in a recent process water sample collected from the heap leach process water circuit exceed Utah groundwater quality standards including arsenic, thallium, selenium, mercury, TDS and free cyanide (Table 2). As drain down progresses and the heaps are gradually flushed by precipitation water, it is likely that these solute concentrations will decline, but the rate of improvement is difficult to predict.

Table 2 – Heap Leach Pad Drain Down Water Chemistry (Combined heap leach pad return flows collected in March, 2008)

| Parameter | Concentration (mg/L) | Utah Groundwater Quality Standards (mg/L) |
|---|---|---|
| pH | **8.85 (1)** | 6.5 – 8.5 |
| TDS | **6790** | 3000 (2) |
| Sulfate | 2770 | Na |
| Arsenic | **3.90** | 0.05 |
| Cadmium | 0.004 | 0.005 |
| Chromium | <0.001 | 0.1 |
| Copper | <0.02 | 1.3 |
| Lead | <0.005 | 0.015 |
| Mercury | **0.003** | 0.002 |
| Selenium | **0.28** | 0.05 |
| Silver | 0.003 | 0.1 |
| Thallium | **0.26** | 0.002 |
| Zinc | <0.01 | 5 |
| Free CN | **0.66** | 0.2 |

(1) Drain down solute concentrations that exceed the Utah Groundwater Quality Standards are shown in bold

(2) Background groundwater quality in the area would be classified as Class II "Drinking Water Quality Groundwater", which has total dissolved solids concentrations of between 500 and 3000 mg/L.

## Geotechnical Stability

Based on calculations performed in 1987 the leach pad slopes are stable with a factor of safety of 1.2 or higher. The heaps were designed to accommodate a random background seismic event with a recurrence interval of once in 500 years (peak horizontal ground acceleration on bedrock of 0.2 g). These calculations were based on the existing exterior slope angle of 2.5 horizontal to 1 vertical. Under less frequent but more intense seismic events, the heaps in their present configuration are anticipated to have movements and/or slope failures which could damage the liner or transport material off of the liner.

A new geotechnical assessment was performed in 2008 to guide final landform design. The new slope stability and deformation calculations were made under both static and dynamic (seismic) loads. The proposed final slopes are designed to have a static factor of safety of greater than 1.3 and a seismic factor of safety of greater than 1.0. Conservative assumptions were generally used in the calculations, so the actual factor of safety achieved is likely higher than the target values. The landform designs detailed in this closure plan are calculated to withstand an earthquake with a 1000 year return period (peak horizontal ground acceleration on bedrock of 0.27 g) without significant deformation or movement of spent heap leach ore off the existing pads.

## CLOSURE PLAN

Based on the available data, elevated metals concentrations within the heap leach pads could pose direct exposure risks to wildlife or people through incidental ingestion of the ore but not via the vegetation uptake pathway. High metals concentrations and salinity in the spent ore could also potentially inhibit plant growth. To minimize exposure risks, maximize revegetation success, limit infiltration and preserve runoff water quality, it is proposed to cap the spent ore with an inert growth media. Process water chemistry would currently prohibit its uncontrolled discharge to groundwater or surface water. In order to minimize potential risks to groundwater and wildlife, drain down water will have to be actively managed until contaminant concentrations decline to below Utah groundwater standards, or until it could be demonstrated that contaminant loading would be low enough to prevent unacceptable groundwater impacts.

### Initial Drain Down

Following the cessation of leach water applications, the pad drain down water will be collected and transferred to the Kennecott Utah Copper Corporation (KUCC) process water circuit. The water will likely be transported by gravity flow in a pipe to the KUCC tailings pipeline downstream from the Copperton Concentrator. Maximum total drain down flows will be less than 2700 gpm initially and are anticipated to decline to less than 200 gpm within six months. This prediction is based upon the behavior of the BC-1 and BC-2 pads during drain down operations in 1998, and drain down that occurred following the temporary cessation of leach water applications to BC-1 and BC-2 in mid-2005 (Figure 2). In reality peak drain down flows are likely to be significantly less because the heap leach pads may be closed sequentially instead of simultaneously.

The Barneys Canyon drain down will be commingled with the more than 40,000 gpm flows that are supplied to the KUCC Copperton Concentrator. The addition of Barneys drain down water to the KUCC process water circuit is not anticipated to have any deleterious effects on process water chemistry. However, the KUCC process water circuit will be monitored and Barneys Canyon discharge will be limited if necessary so that solute concentrations do not affect the ability of KUCC to discharge water from the tailings impoundment to the Great Salt Lake. All storage ponds and water management structures at Barneys Canyon will still be in place during the initial drain down period, so discharge to the KUCC process circuit can be stopped if needed. Both arsenic and thallium will be removed from solution during interactions with the tailings solids in the pipeline (Shand et al., 1998; Smith and Huyck, 1999). UPDES permit number UT0000051 already lists drain down water from Barneys Canyon as one of the allowable components of the process water that may be discharged to the Great Salt Lake from the tailings impoundment. The UPDES permit will continue to govern the quality of discharge from the KUCC tailings impoundment throughout the Barneys drain down period.

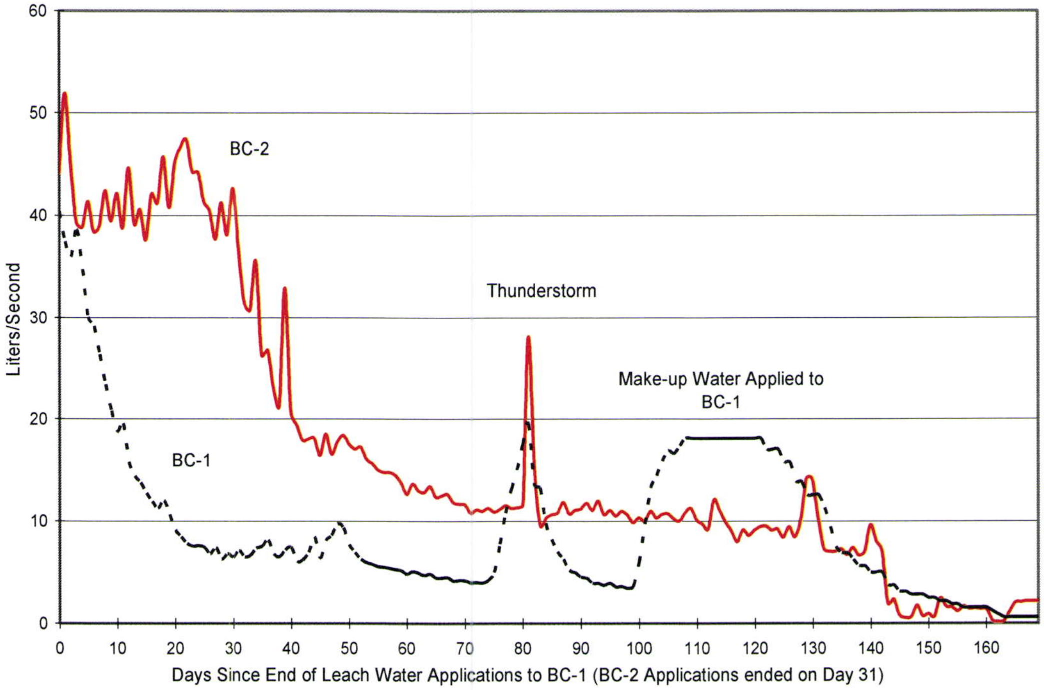
Long-Term Water Management

Assuming a total leach pad surface area of 160 acres, a precipitation rate of 16 inches/year and a conservatively high infiltration rate of 30%, long term combined base flows discharging from the pads should ultimately decline to 40 gpm total or less. The highest infiltration rate modeled for the un-vegetated and unreclaimed waste rock dumps at the Bingham Canyon Mine is 30% (range about 15 to 30% depending on elevation and waste rock lithology). It is likely that actual infiltration rates into the heap leach pads will be significantly lower because they will be capped with a more fine-grained growth media, typically receive less precipitation than the higher Bingham dumps, will be revegetated thereby increasing evapo-transpiration rates, and clean runoff will be directed off the pads before it can infiltrate.

During the years of active mining planned at KUCC, the base flow will continue to be transferred to the process water circuit where it will represent less than 0.2% of the total flow from the Copperton Concentrator. After the closure of the Bingham Canyon Mine, the water will be transferred to the KUCC post-closure water management systems. Flows from the Barneys heap leach pads will represent less than five percent of the probable post closure flows that will require management at Bingham Canyon. The alkaline Barneys Canyon water will be mixed with the acidic Bingham Canyon water, providing some neutralization benefits. Arsenic will be removed from solution by contact with the iron-rich ARD neutralization sludges that will be generated by water treatment at the Bingham Canyon mine (Smith and Huyck, 1999).

Barneys Canyon may eventually seek permission from the Utah Division of Water Quality to cease active management of drain down water if water quality from any of the heaps improved enough so that 1) all dissolved concentrations are consistently below Utah Groundwater Quality Standards or 2) long term flows and contaminant loading rates are low enough to demonstrate that there would be a de minimis impact to down gradient aquifers. If it is determined that water no longer needs to be collected from one of the heap leach pads, it could either be directed into the vadose zone without surface expression, or allowed to discharge to the surface as a small spring if water quality would be protective of wildlife.

Figure 2 – Drain Down flows for the BC-1 and BC-2 Heap Leach Pads




## Final Landform Construction

The heap leach pads will be closed in place with a clean cover to minimize exposure risks and limit infiltration. *Before the heap leach slopes are reduced, the following actions will be taken:*

1) *The ditch along the inside of the lined perimeter berm will be cleaned out to remove any cross dams formed by fine-grained material that has washed down the existing angle of repose slope. Note the ditch will not be cleaned all the way down to the liner because this risks damaging the liner.*
2) *Additional perforated pipe will be laid along the inner exposed toe (below the crest) of the HDPE-lined perimeter berm, so that any water that might accumulate there is directed to down gradient collection points. Along with the regional topography all of the heap leach pads slope to the east, so no perforated pipe will be placed on the western (uphill) margin of the pads.*
3) *As the outer slopes of the spent heap leach ore are pushed down, more permeable coarse material will naturally segregate at the inside base of the liner berm surrounding the perforated pipe. The area around the perforated pipe will be visually inspected during slope reduction to ensure that more coarse-grained spent heap leach ore is accumulating there.*

The slopes will be stabilized by the construction of a wedge of clean fill placed adjacent to the liner perimeter to minimize geotechnical risks (Figure 3). This will allow all of the slopes to be reduced to between 2.5:1 and 3:1. As shown in Table 3, the higher the berm which is constructed adjacent to the liner, the steeper the slope that is geotechnically stable. The design criteria in Table 3 are based on a the geotechnical assessment performed in 2008

Table 3 – Heap Leach Closure Slope Geometries for Geotechnical Stability

| Maximum Outer Slope Angle | Maximum Outer Slope Horizontal to Vertical | Minimum Toe Berm Dimensions (height and base width) (1) |
|---|---|---|
| 18 degrees | 3:1 | 4 ft high by 12 ft wide |
| 20 degrees | 2.75:1 | 5 ft high by 14 ft wide |
| 22 degrees | 2.5:1 | 7 ft high by 18 ft wide |

(1) This wedge of clean fill for the buttress includes the liner berm that is already in place so total material requirements will be reduced by the volume of material in the existing berm.

The wedge of clean fill will be compacted as it is placed. The final form of the buttress will be roughly triangular in shape, will cover and incorporate the existing liner berm and will tie into the natural ground surface at its toe to the outside of the existing berm (Figure 3). This will allow the outer edge of the liner to be covered without pushing spent ore off of the liner. In many locations the existing liner berm is already several feet high (as measured from the inside base of the liner berm), so a significant portion of the required closure buttress is already in place. Dozers and/or scrapers will likely be used to reduce the spent ore angle of repose slopes to the desired angle. The spent ore slope will be reduced until it toes into the inside of the existing liner berm. Clean fill will then be imported and placed over and adjacent to the existing berm to create the buttress (Figure 3). Topsoil and additional un-compacted clean fill (if needed for final landform design) may then be placed over the compacted buttress at the same time the heap leach pad cover is constructed. If required to reach a 2.5:1 slope and still ensure that all spent ore remains on the liner, the height of the clean fill buttress may be increased above seven feet so that the spent ore slope can be further reduced by pushing spent ore against the clean buttress.

The entire heap leach pad surface will be capped with a cover composed of 2.5 feet of clean fill and six inches of topsoil. The surface will then be seeded with the native seed mix specified in the 2000 Barneys Canyon Mine Mining and Reclamation Plan for topsoiled areas. Two modifications to the 2000 seed mix are proposed. Yellow sweet clover seed should be eliminated from the mix because it has been shown to out-compete many of the other species in the seed mix on the Barneys Canyon waste rock dumps. About 20 seedlings per acre of Gambel oak will also be planted. The proposed seed mix for the heap leach pad cover is presented in Table 4.

Figure 3 – Cross Section of the Preferred Final Heap Closure Option with a Clean Cover and Slope Buttress

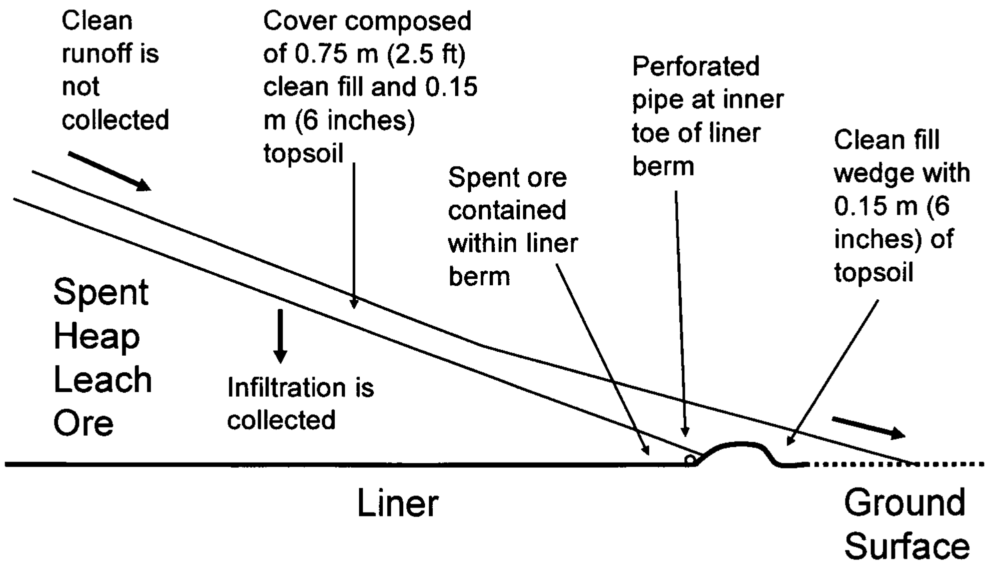



Table 4 – Heap Leach Pad Seed Mix

| Common Name | Scientific Name | Pure Live Seed (lbs/acre) |
|---|---|---|
| GRASSES | | |
| Bluebunch wheatgrass (1) | *Agropyron spicatum* | 3 |
| Intermediate wheatgrass | *Agropyron intermedium* | 3 |
| Great basin wildrye | *Elymus cinereus* | 3 |
| Canby bluegrass | *Poa canby* | 1 |
| Cereal rye | *Secale cereale* | 4 |
| | | |
| LEGUMES | | |
| Cicer milkvetch | *Astragalus cicer* | 2 |
| Ladak alfalfa | *Medicago sativa* | *1* |
| | | |
| FORBS | | |
| Yarrow | *Achillea millefolium* | 0.2 |
| Small burnette | *Sanguisorba minor* | 1.5 |
| | | |
| SHRUBS | | |
| Basin big sagebrush | *Artemisia tridentata* | *0.1* |

| | | |
|---|---|---|
| Rubber rabbitbrush | *Chrysothamnus nauseosus* | 0.5 |
| | | |
| TREES | | |
| Gambel oak | *Quercus gambelli* | 20 seedlings/acre (2) |

(1) Western wheatgrass (Agropyron smithii) may be substituted for bluebunch wheatgrass if necessary.
(2) Trees should be planted in clumps of 10 to 30 to establish a mosaic of scrub oak and grassland.

This cover will perform multiple purposes including:

- Preserve runoff water quality so that it can be safely directed off of the pad where it will be allowed to infiltrate into the native ground.
- Provide a thick growth media so that native vegetation including woody shrubs and scrub oak can be established on the heap leach pads.
- Provide an erosion resistant cover so that the underlying spent ore will not be exposed or transported off the pad by wind or runoff.
- Reduce plant metals uptake to ensure all vegetation continues to remain below NRC (2005) animal feed guidelines.
- Reduce the risk of incidental ingestion of metals-rich soils by animals or humans.
- Minimize the risk that animal burrowing or tree throw will transport spent ore to the surface of the cover.
- Enhance evapo-transpiration on the heap leach pads, ultimately reducing the volume of water that will infiltrate into the ore.

The three foot cover will be sufficient to perform all of these functions. Average global rooting depths for semi-arid shrub lands indicate that 90% of the plant roots generally occur in the upper two feet (Jackson, 1999). A three foot cover should reduce plant exposure to and uptake of metals in the underlying waste by more than an order of magnitude. Given that the tissue metals concentrations of plants currently growing directly in the ore are already below the livestock feed guidelines (NRC, 2005), a three foot cover will definitely be sufficient to protect forage quality. It would also be sufficient to prevent accidental ingestion of metals-rich soils clinging to the roots of plants uprooted by grazers and browsers. Based on ten year old covers over acidic waste rock at the Bingham Canyon waste rock dumps, a three foot cover should be able to support a diverse community of grasses, forbs and woody shrubs. It is anticipated that the cover will be able to support the climax Gambel oak vegetation community that grows in the vicinity of the heap leach pads.

An estimated 700,000 cubic yards of clean fill will be required for the cover and the buttress. Clean fill will be borrowed from the native hillsides immediately adjacent to the heap leach pads (Figure 1). All borrow areas will be within the current DOGM permit boundaries. Based upon the extensive geotechnical drilling program that occurred before the heap leach pads were constructed, the entire area is underlain by the Harkers Alluvium (SHB, 1988a; SHB, 1988b). This is a thick unconsolidated alluvial fan sequence of interbedded sandy silty gravel, gravely silty sand, sand and clayey silt. A well graded gravelly silty sand would make an ideal cover material because it will not be prone to erosion, will provide a good growth media and has sufficient water storage capacity to act as a store and release infiltration limiting cover. None of the borings which varied from 30 to 65 feet in depth encountered the base of the alluvial unit.

It is anticipated that less than 80 acres will be impacted by the borrow operations. There is sufficient topsoil within the existing stockpiles to cover the heap leach pads to a depth of six inches. Topsoil will also be stripped from the borrow areas and used immediately for reclamation of the heap leach pads or stockpiled for reuse during borrow area reclamation. All borrow areas for the heap leach pad fill will be reclaimed by recontouring into a free draining natural landform with maximum 2.5:1 slopes. The borrow area surfaces will be covered with at least six inches of topsoil before being seeded with the native seed mix specified in Table 4. *The borrow areas will be recontoured, topsoiled and seeded within six months of completion of the heap leach pad reclamation.* Sedimentation ponds will be established in each drainage line below the heap leach pads and borrow areas. These ponds will be maintained to capture sediment until the borrow areas and leach pad caps have been successfully revegetated.

These measures will allow the land to ultimately be used as open space and wildlife habitat.

Infrastructure Removal

As detailed in the existing closure plan submitted to DOGM in 2000, all remaining infrastructure except for those items with a valid post-mining use will be demolished and the land will be reclaimed. Any cyanide contaminated soils identified during the demolition will be neutralized on site with sodium hypochlorite or by other proven means. Any soils contaminated with hydrocarbons will be bio-remediated at the Bingham Canyon Mine's permitted bioremediation pad or transported offsite for disposal at an appropriate treatment, storage or disposal facility. Any reagents left on site at closure will be transported off site for sale, reuse or destruction. Demolition debris will be salvaged if possible or buried on site.

After initial drain down has been completed (discharge less than 10% of current return flow), any structures that are not needed for post-closure water management will be removed. All un-needed pipes such as barren solution return lines and leak detection infrastructure will be removed and buried within the heap leach pads. Steel piping may be cleaned and recycled. Pipes that collect and transmit the seepage base flow from each pad will be left in place to continue transfer of the contact water from the pads to the KUCC process water circuit. This transfer piping will only be removed if it is ever determined that active management of the seepage water is no longer required. If this seepage piping is ever removed, it will be disposed within the KUCC waste rock dumps above the cut off walls, or sent to an appropriate off-site landfill or recycler. The liners in the pipeline trenches outside of the leach pads will be removed from the trenches, rolled up and placed in the solution pond excavations prior to their backfilling. The trenches will then be backfilled, topsoiled and revegetated.

The barren and pregnant solution ponds will be pumped dry and the sludges that have accumulated in the pond floor will be allowed to air dry. The pond liners will then be removed from the anchor trenches, folded into the low point of the pond basins and used to encapsulate the sludge, thereby minimizing water and plant-root contact. The pond areas will then be backfilled with clean fill from nearby stockpiles to re-establish pre-mining drainage patterns, to cover the liners beneath at least five feet of fill, and to recreate a natural landscape. The entire disturbed surface (about five acres) will then be covered with six inches of topsoil and seeded.

The paved road connecting the mine office with the access road to the Copperton Concentrator will be left in place. This road will be needed to access the mine area for inspections and water management activities. All unpaved roads, except for those needed for post closure water management, sulfide ore access, monitoring well access and final heap reclamation, will be recontoured, ripped, receive approximately six inches of topsoil and will be planted. At the end of the ten year monitoring period, any roads that are no longer needed will also be reclaimed.

Residual Sulfide Ore

Approximately 150,000 tons of net acid generating sulfide ore is currently stored on site in a single stockpile (at the old ore stockpile and crushing plant area). The ore is being used as a fluxing agent at the KUCC smelter so that the contained gold can be recovered. Current plans are to process all of this material through the smelter. At the current processing rate of roughly 20,000 tons/year it should take another seven years to consume the entire stockpile. The entire stockpile is currently covered with an HDPE liner to protect it from precipitation and prevent ARD generation. However, if for some reason all the material cannot be used as a fluxing agent, the sulfide ore will either be processed through the nearby KUCC Copperton Concentrator or it will be placed in the Bingham Canyon Mine waste rock dumps. Processing at the concentrator would allow some of the gold in the sulfide ore to be recovered, while co-disposing of the tailings in the much larger tailings stream from the Bingham Canyon mine. Once the entire pile has been consumed, the HDPE cover will be removed and the underlying footprint will be topsoiled and seeded.

## LONG-TERM MONITORING

Following the cessation of active heap leach operations at each pad, flow from each pad will be monitored monthly for the first year and quarterly for the next nine years or less if it is determined that active water management is no longer required. Water quality will be monitored semi-annually (during the second and fourth quarters) from each of the heap leach pads for ten years or less if it is determined that active water management is no longer required. If permission is ever sought to cease active management of the discharging water from a single pad or for the combined flows from all the pads, then sampling frequency will be increased to monthly for three months to demonstrate that direct discharge of the water will not pose an environmental risk.

Daily performance monitoring of the leak detection systems on the pads will continue for at least six months after the cessation of leach water applications. After six months, and when drain down flows from a pad declines to less than 60 gpm (<10% of typical operating flows), daily performance monitoring of the leak detection system will be discontinued if there is no evidence of leakage. Once the volume of water stored in the pads and the head on the liners becomes so small, the risk of significant liner leakage declines dramatically. At this point the leak detection infrastructure will be dismantled and removed or buried. However, monitoring of the surrounding monitoring well network will continue.

Quarterly sampling of the twelve down gradient and twice-yearly sampling of the two up gradient monitoring wells around the heap leach pads will continue for one year after the cessation of leach water applications on the last pad. After the first year, water sampling will be conducted annually at all wells for at least nine years. Compliance limits for the wells will remain the same as they are now (Permit number UGW350001). Wells which are in compliance at the end of the ten year period may be abandoned in accordance with Utah State requirements.

Quarterly reports will be submitted to the Utah Division of Water Quality during the first year following cessation of leach water applications on the last pad. After the first year, quarterly reporting will be discontinued and an annual report will be submitted for nine additional years.

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